

# ***Laotris luzulae* (Hymenoptera, Braconidae, Alysini, Dacnini), a new species from the southwest of England**

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## **Abstract**

*Laotris luzulae* Godfray, **sp. nov.** is described in the small genus *Laotris* Nixon, 1943, (Braconidae, Alysini, Danusini) from five specimens reared from *Cerodontha silvatica* (Groschke, 1957) (Diptera, Agromyzidae) mining *Luzula sylvatica* (Huds.) Gaudin (Juncaceae) in Devon and Gloucestershire in the southwest of Great Britain. Six further specimens from Somerset caught as adults in the 1950s are also noted. It differs morphologically from the three described species of *Laotris* and shows a 4.2% and 6.6% genetic distance at the CO1 barcode locus from an undescribed North American species and from the European *L. striatula* (Haliday, 1839), respectively.

## **Keywords**

Alysini, Braconidae, Dacnini, Europe, *Laotris*, new species, United Kingdom

## **Introduction**

*Laotris* Nixon, 1943, is a small genus of Alysini (Braconidae) in the tribe Dacnini; it was established by Nixon (1943, 1954) to accommodate the rather anomalous species, *striatula*, which Haliday (1839) had described in *Alysia* Latreille, 1804, with Marshall (1891) moving it to *Dacnusa* Haliday, 1833. In general shape and body size, this

species resembles the many species of *Dacnusa*, *Chorebus* Haliday, 1833, and *Exotela* Förster, 1863, that largely parasitise Agromyzidae (Diptera), and it was with these genera that Nixon associated *Laotris*. However, Griffiths (1964) argued that it shared derived characters (in particular the striate second metasomal tergite and the mandible with a fourth small tooth dorsal to the large middle tooth) with members of the *Coelinus* genus-group and he considered *Laotris* a basal member of that assemblage. Wharton (1994) agreed with this placement, and considered *Laotris* to be most closely related to, and possibly congeneric with, *Synelix* Förster, 1863 (= *Ectilis* Nixon, 1943). Keys to the genera that have at some time been included in *Coelinus* Nees, 1819, are provided by van Achterberg (2014) and Zheng et al. (2017) which include *Laotris* because of its similar mandibles.

Griffiths (1968) described a second species, *L. rupestris*, from Poland and Tobias (1998) a further species, *L. minuscularia*, from far-east Asian Russia. *Laotris striatula* is a parasitoid of *Cerodontha* (*Dizygomyza*) *luctuosa* (Meigen, 1830) (Agromyzidae) which mines *Juncus* (Juncaceae) reeds while the single specimen of *L. rupestris* was reared from an unidentified species of *Cerodontha* (*Dizygomyza*) mining *Carex sempervirens* Vill. (Cyperaceae) (Griffiths 1968).

*Laotris luzulae* is described here based on five specimens reared from *Cerodontha* (*Dizygomyza*) *silvatica* (Groschke) (Agromyzidae) mining *Luzula sylvatica* (Huds.) Gaudin (Juncaceae) in Devon and Gloucestershire in the southwest of Great Britain. A further six swept specimens were found in unsorted material in the Natural History Museum, London, UK (NHMUK), also from southwest Britain (Somerset). It differs in morphology and biology from the previously described species and shows a genetic divergence of 6.5% from *L. striatula* at the CO1 mitochondrial barcode locus.

## Methods

### Material examined

Five specimens of an undescribed species of *Laotris* were reared from *Cerodontha silvatica* in south Gloucestershire and south Devon (full details in type designation below).

In addition, six specimens (three males and three females) were found amongst unsorted Dacnusiini in the NHMUK's collections. They too come from the southwest of England and were collected in the Haddeo Valley, Brompton Regis, Somerset (Grid Reference, SS9529) by JF & DMS Perkins on 13.viii.1952. They are included in the NHMUK's digital catalogue with codes NHMUK010885170 to NHMUK010885175.

Material of *L. striatula* used for genetic analysis was from a collection of five males and a female reared from *Cerodontha luctuosa* on *Juncus effusus*, four from Hessle (Grid Reference, TA033272; collected 6.xii.2020) and two from Anlaby (Grid Reference, TA033278; collected 18.i.2021 & 7.ii.2021); both near Hull, Yorkshire in the north

of England (BP Warrington, codes A1292-5 [Hessle] and A1303 & A1308 [Anlaby]). Here and below, “codes” refer to entries in a database of those parasitoid wasps in the collection of the National Museum of Scotland (NMS, Edinburgh) that have been examined by the author. Three non-reared specimens in the NMS, and 32 specimens in the NHMUK, including material studied by Nixon and Griffith, were also examined.

Photographs were taken through a Leica M125C microscope with focus stacking using Leica LAS X software and final processing in Photoshop.

CO1 sequencing was carried out on legs removed from specimens by the Biodiversity Institute of Ontario at the University of Guelph. To obtain maximum sequence information, initial Sanger sequencing was supplemented by “next generation” short read sequencing. Sequence analysis was carried out on the BOLD platform and using the programme MEGA11 (Molecular Evolutionary Genetics Analysis version 11, Tamura et al. (2021)). The sequence data is publicly available at <http://v4.boldsystems.org/>.

## Systematics

*Laotris luzulae* Godfray, sp. nov.

<https://zoobank.org/9803187F-B3AF-4EE8-BA3C-853C59EBE858>

**Type material. Holotype:** female (code: NK64), Hencliffe Woods, south Gloucestershire, Grid Reference, ST6371, emerged 13.v.2003, in NMS.

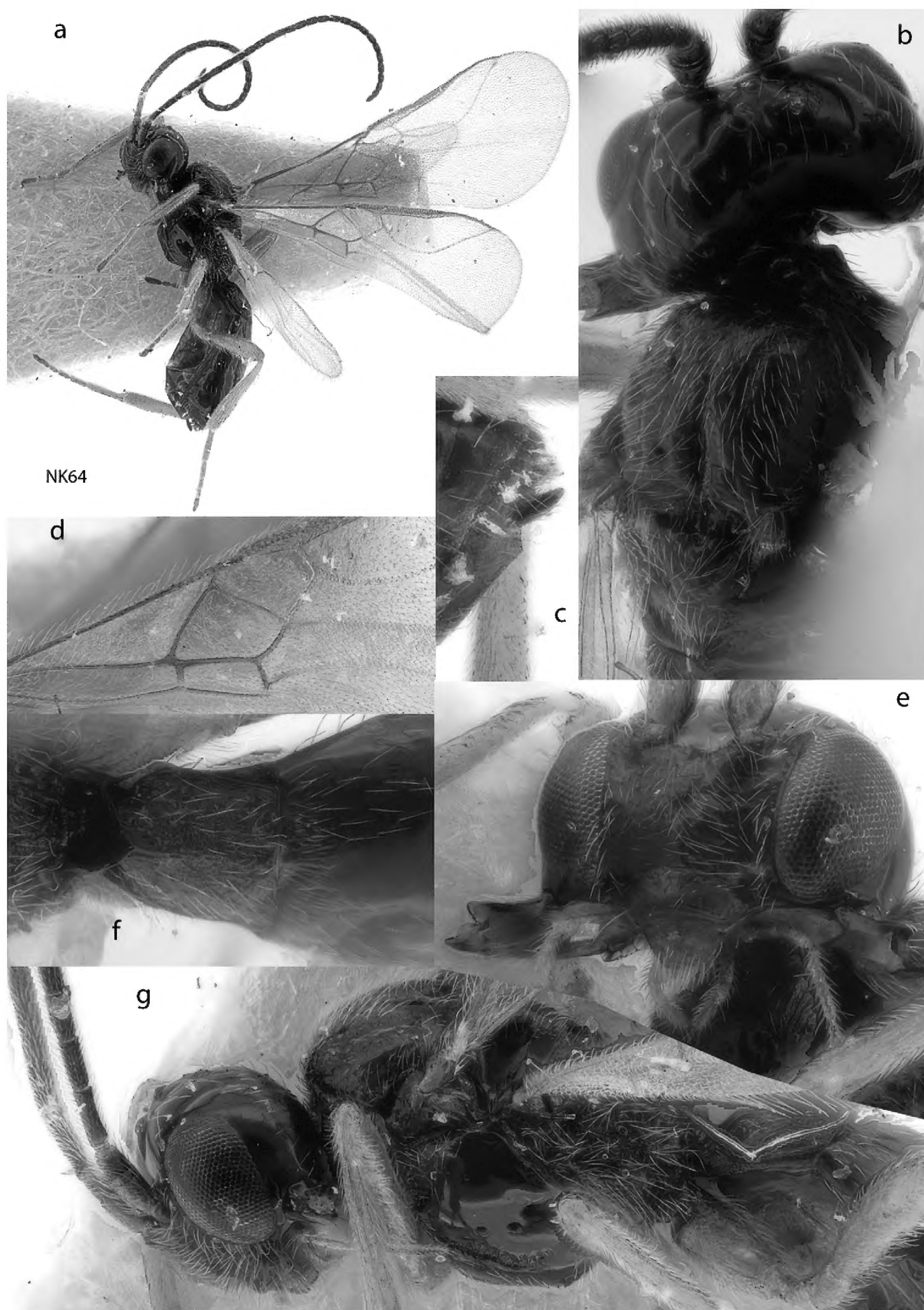
**Paratypes:** female (code: NK62, in NHMUK with digital catalogue number NHMUK010885191), emerged 27.iv.2002, and male (code: NK63, in NMS), emerged 7.v.2003, otherwise same data as holotype; two females (codes: NK195, NK196, deposited in NMS), Steps Bridge, South Devon, Grid Reference, SX801884, both collected 15.iv.2004 deposited in NMS.

NK62, NK63 & NK64 were reared by DJ Gibbs and NK195 & NK196 by M. Storey.

**Description of female (Fig. 1). Size:** body length (excluding antennae), 2.3–2.5 mm; wing length 2.7–3.0 mm.

**Colour.** Head black except for labrum, mandibles and part of cheek immediately above insertion of mandibles which are brown. Antennal scape, pedicel and proximal part of first flagellar segment brown with rest of flagellum black; palps pale yellow. Mesosoma black except for small brown patches near base of wings. Legs including coxae light yellow-brown (in some specimens with base of hind coxa dark) with only fifth tarsal segment infuscated. Petiole black with rest of metasoma shading from dark brown anteriorly to black posteriorly.

**Head.** Antennae with 30 or 31 segments (3 specimens each), approximately equal in length to wing; first flagellar segment 3.4 times as long as maximally wide, 0.75 times as long as scape plus pedicel; second flagellar segment 2.8 times as long as maximally wide; distal flagellar segments approximately two times as long as maximally wide. Head 1.7 times as wide as long in dorsal view, with sparse forward-directed setae



**Figure 1.** *Laotris luzulae* sp. nov. female **a** general habitus **b** dorsal view of head and mesosoma **c** ovipositor **d** basal part of forewing **e** face and mandibles **f** dorsal view of first and second metasomal tergites **g** lateral view of head and mesosoma.

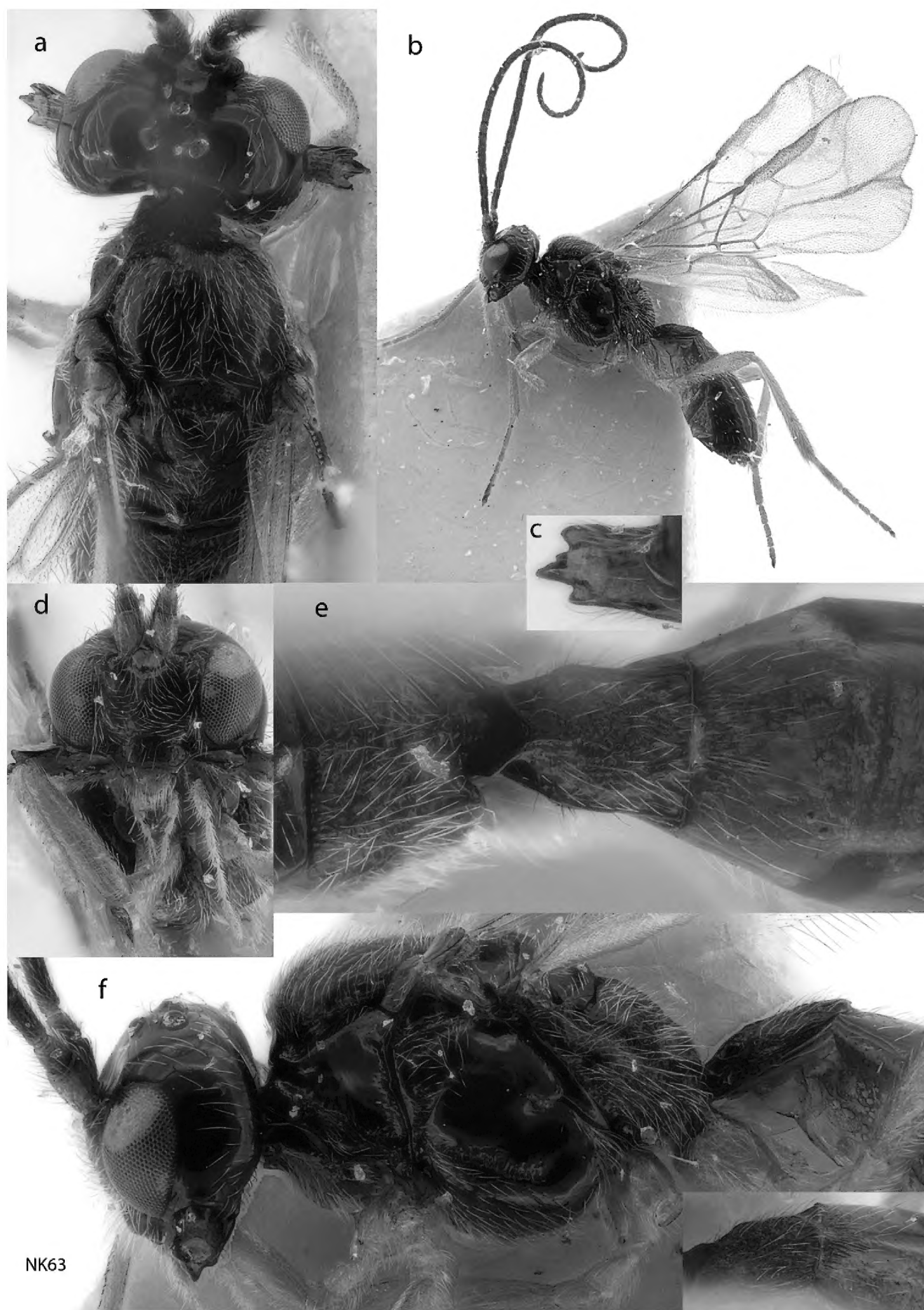


on occiput and temples; ocelli arranged in an equilateral triangle with OOL almost exactly twice POL; OOL 2.3 times posterior ocellar diameter, a small medial depression on frons dorsal to the antennal insertions. In lateral view, width of eye approximately equal to width of cheek with frons slightly protruding beyond eye; clypeus distinctly protruding. Face at narrowest point half width of head and width and height (measured from ventral labrum rim to antennal insertion) equal, slightly roughened with extensive but not dense setae which are ventrally directed along eye margin, medially directed above labrum, dorso-medially directed on lateral panels of face, and dorsally directed near mid-line. Clypeus 0.4 times as high as maximum width, its ventral margin with a narrow carina which is shallowly concave medially and forms distinct angles at ventral-lateral corners. The clypeus is largely bare or with sparse ventrally directed setae. Labrum ventrally with dense setae which are approximately equal in length to height of labrum. Maxillary palps six-segmented and reaching to a little before middle of mesopleuron, last segment 6 times as long as wide and 1.3 times length of penultimate segment. Labial palps four-segmented. Mandible more or less parallel-sided, 1.9 times as long as medially wide, with a long central tooth and subequal first and last teeth; a small fourth tooth appears as an outgrowth on anterior edge of central tooth (not posterior edge as in many *Chorebus* spp.).

**Mesosoma.** Mesosoma in lateral view 1.4–1.5 times as long as high. Pronotum dorsally with a medial pit; laterally largely hairless, smooth and shining above oblique suture, with some rugosity around its margins. The oblique suture is rugose with some setae below. Mesoscutum dorsally 1.1–1.2 times as broad as long, anteriorly roughened, its surface covered with backwardly directed setae except for posterior lateral margins. Notaulices well-developed as a series of connected pits that converge on, but do not quite meet, the postero-medial fovea. Fovea elongate, 6–7 times as long as wide. Prescutellar furrow 3 times as broad as long, with a medial longitudinal costa and indistinct sub-medial costae. Scutellum smooth with backwardly directed setae, especially at margins and posterior apex. Postscutellum with backwardly pointed setae and a median carina that bluntly protrudes in lateral view. Propodeum strongly sculptured with backwardly directed setae, most dense posteriorly. Mesopleuron bare and shining centrally; epicnemial (antero-dorsal) area with setae and rugosity, a small patch of setae at postero-ventral corner; pleural suture and episternal scrobe smooth. Precoxal suture strong and ribbed, extending from anterior margin about four-fifth of way to posterior margin. Area below precoxal suture with setae. Metapleuron with rugose sculpture similar to propodeum, covered with quite dense postero-ventrally directed setae.

**Legs.** Hind coxa dorsally somewhat rugose. Hind femur 4.5 times as long as maximum width. Hind tarsus approximately same length as hind tibia. Ratio of hind tarsal segment lengths (from base): 1:0.58:0.39:0.31:0.38.

**Wings.** Pterostigma elongate, approximately 7 times longer than broad, more or less parallel-sided beyond origin of radius (*r*) (at 1/5) until 4/5 when it tapers to metacarp (*R1a*). First segment of radius (*r*) slightly longer than width of pterostigma; radius distally (*RS*) somewhat sinuate reaching wing margin before wingtip; metacarp half



**Figure 2.** *Laotris luzulae* sp. nov. male **a** dorsal view of head and mesosoma **b** general habitus **c** mandible **d** face **e** dorsal view first and second metasomal tergites **f** lateral view of head and mesosoma.

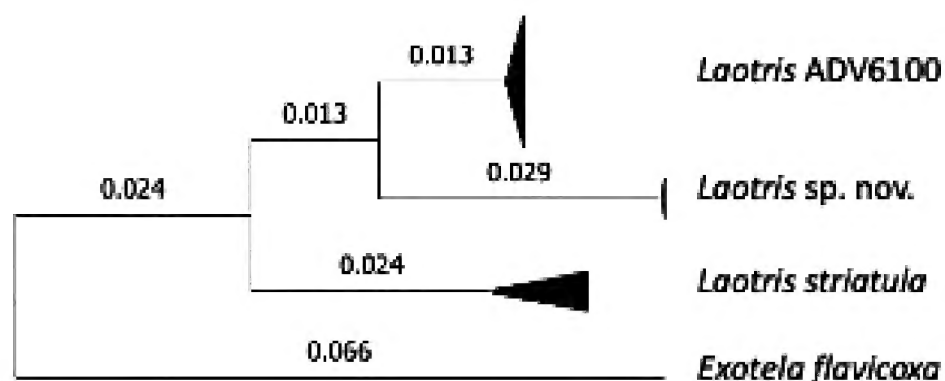
length of pterostigma. Vein *m-cu* received into first submarginal cell (antefurcal condition). First subdiscal cell closed at postero-ventral corner by *2cu-a*.

**Metasoma.** Metasoma 1.2–1.3 times length of mesosoma. First tergite (petiole) 1.4 times as long as its posterior width, initially widening from base but approximately parallel-sided in posterior two thirds. At base, two carinae run from margins diagonally to join before centre and continue as a short, indistinct, medial ridge. Surface of first tergite rugose with some indistinct longitudinal ridges, covered in sparse backward-directed setae except for central area which is largely bare. Lateral and posterior edges of first tergite are margined by a narrow carina. Second tergite with an area of longitudinal striae that extends only over its basal 1/3–1/4. Most of tergite covered with sparse setae, except for posterior central area and posterior margin. There are rows of setae at bases of posterior metasomal tergites. Ovipositor does not project beyond apical tergite in retracted position.

**Description of male (Fig. 2).** **Size:** body length (excluding antennae), 2.3–2.7 mm; wing length 2.7–2.8 mm.

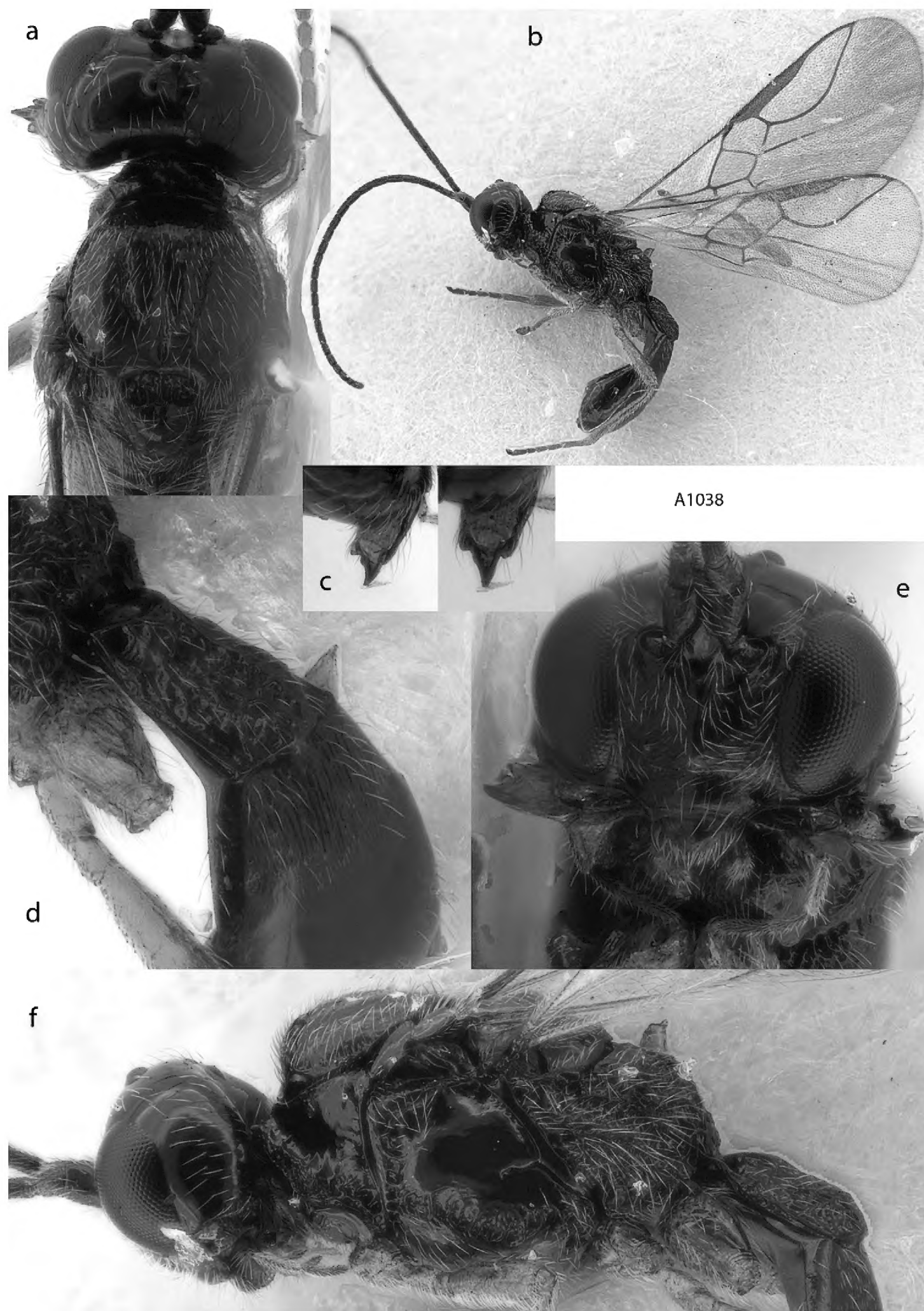
The single reared male specimen has 33 antennal segments while the three swept male specimens have 29, 30 & 31 segments. Otherwise, the male is very similar to the female with no obvious sexual dimorphism.

**Molecular analysis.** Sequence data from the mitochondrial CO1 gene (the standard barcode locus) were obtained from three specimens each of the new species and *L. striatula*. Full barcode sequences (658bp) were obtained from five specimens and 513bp from one specimen of *L. luzulae*. The BOLD database contains no further European specimens of *Laotris* but ten specimens of a species of wasp collected in the Yukon (Canada) and assigned the Barcode Index Number (BIN) ADV6100 which showed a 4.2% genetic distance from *L. luzulae*. The new species was placed in BIN AEO8807 and showed a 6.6% genetic distance from *L. striatula* (placed in BIN AEO8806) (Fig. 3). The magnitude of the genetic divergence supports the hypothesis based on morphology that *L. luzulae* is distinct from *L. striatula*, and also from the undescribed North American species.



**Figure 3.** Neighbour-joining tree (CO1 gene, Kimura 2-parameter model) of *Laotris* species with an *Exotela flavicoxa* (placed by some authors in the genus *Antrusa*) sequence used as an outgroup. The height of the triangular wedges represents sample size and their horizontal width the genetic variation within the species.





**Figure 4.** *Laotris striatula* Haliday female **a** dorsal view of head and mesosoma **b** general habitus **c** two views of mandible **d** dorso-lateral view of first and second metasomal tergites **e** face **f** lateral view of head and mesosoma.



## Discussion

The new species differs from *Laotris striatula* (Fig. 4), the only common and widespread *Laotris* species in Europe, in morphology, biology and DNA sequence. The main morphological differences are:

- Striations on second metasomal tergite restricted to anterior half or less; in *L. striatula* the striations typically cover the whole surface though in some specimens the striations cover just the anterior three quarters.
- Normally over 30 antennal segments in both sexes while in *L. striatula* there are normally fewer than 28. Of the *L. luzulae* material examined one (out of 10 with intact antennae) had 29 antennal segments as did one (out of 35) *L. striatula*.
- Legs largely light yellow-brown with only the base of the hind coxae infuscated; the majority of *L. striatula* have greater infuscation, and in lighter specimens the legs are red-brown rather than yellow-brown.
- Pubescence of the mesoscutum (especially the lateral lobes), propodeum and metapleuron more extensive than in *L. striatula*.

I have not seen the single specimen and holotype of *L. rupestris*, which is in the Museum of the Polish Academy of Science, Warsaw, but Griffith's description clearly demonstrates it is morphologically distinct. In comparison with the new species, *L. rupestris* has very dark legs, fewer antennal segments (28), a less developed additional tooth on the mandible and a largely smooth metapleuron. It shares with *L. luzulae* more restricted striations on the second metasomal tergite compared with *L. striatula*.

I have also not seen the type of *Laotris minuscularia* Tobias (in the Zoological Institute, Academy of Sciences, St Petersburg) which was described from the Vladivostok region (Primorsky Krai) of the Russian Far East. However, its small number of antennal segments (20) strongly suggests it is distinct from the species described here.

The three *Laotris* whose life history are known all attack agromyzid flies in the genus *Cerodontha*, subgenus *Dizygomyza*, though different host species on different host plant genera. *Laotris* is regarded as a relatively plesiomorphic member of the *Coelinius* genus group (Griffiths 1964; Wharton 1994) and the only member of the group that attacks Agromyzidae. Griffith (1966) points out that the most plesiomorphic members of the *Dacnusa* genus group, which has radiated greatly on Agromyzidae, also attack *Cerodontha* (and *Agromyza*) species feeding on monocots and suggested this may reflect the life history of the first Dacnusiini. Unfortunately, there was insufficient phylogenetic signal in the barcode DNA sequence to explore this hypothesis further.

It is striking that all three collections of *L. luzulae* come from south-west England, though of course this may reflect sampling bias. The host is not common in the UK and in addition to records from the south-west it has been recorded from Wales, Northern Ireland and Berkshire (<https://agromyzidae.myspecies.info/node/1499>). A second species of *Cerodontha*, *C. luzulae* (Groschke), also feeds on *Luzula*, but has a

more northerly distribution and is recorded from North Wales and Scotland. I have seen 45 parasitoids reared from this host in Scotland by KP Bland which were 33 *Chorebus merellus* (Nixon, 1937) (Dacnusiini), 9 *Apodesmia* nr. *similis* (Szépligeti, 1898) (Braconidae, Opiinae), 2 *Phaedorotoma reptantis* (Fischer, 1957; *sensu* C van Achterberg, in litt.) (Opiinae) & 1 *Pediobius metallicus* (Nees, 1834) (Chalcidoidea, Eulophidae). Griffiths (1968) also notes 11 German and Polish records of *C. merellus* from *C. luzulae*. The absence of *Laotris luzulae* from these rearings suggest it may be specific to *Cerodontha silvatica* rather than to *Cerodontha* feeding on *Luzula*. The only other parasitoids of *C. silvatica* I am aware of are a single specimen of *C. merellus* reared by JP Day in Devon, UK (this parasitoid is recorded from a number of *Cerodontha* spp.) and a single specimen of the relatively polyphagous (within the Agromyzidae) *Grammospila rufiventris* (Nees, 1812) (Braconidae, Alysiinae, Alysini) reared by DJ Gibbs in Gloucestershire, UK. Apart from the Griffiths records, all the other wasps mentioned here are in the NMS collection.

Wharton (1994) stated he had examined five specimens of *Laotris* from North America (three from Colorado and singletons from the Yukon and British Columbia) which he believed belonged to two species. The cluster of ten specimens from the Yukon in the Bold database confirms the presence of *Laotris* in North America (low resolution photographs of three of these specimens on BOLD show it has the wing venation and general habitus of *Laotris*). *Cerodontha luctuosa*, the host of *L. striatula*, is found in North America, as is *Chorebus cytherea* (Nixon, 1937) (Dacnusiini), the commonest parasitoid of this fly in Europe (data in BOLD). It would thus not be surprising if *L. striatula* occurs in North America.

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I am very grateful to David Gibbs, Malcolm Storey, Barry Warrington, Keith Bland & John Day who reared the wasps studied here. Mark Shaw (NMS) passed the *L. luzulae* specimens to me and has been an invaluable source of advice on the Braconidae for many years. I particularly thank Paul Hebert (University of Guelph) for sequencing these (and many other wasps) and Jayme Sones and her team at Guelph for all their technical assistance. Gavin Broad allowed me access to the main collection and unsorted material at the NHMUK and provided much helpful advice including commenting on a draft of this paper which was further improved by Mark Shaw and Javier Peris-Felipo's refereeing.

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